ENGINEERING GUIDELINES

City Of Muscatine, Iowa
Public Works Department

October 17, 2007 (Engineer's Revision)

NOTE: THESE STANDARDS ARE SUBJECT TO CHANGE.

DEFINITIONS:

ADA—Americans with Disabilities Act
ASTM—American Society for Testing and Materials
DOT—Department of Transportation
HMA—Hot Mix Asphalt
I.D.—Inside Diameter
IDNR—Iowa Department of Natural Resources
LF—Linear Feet
NPDES—National Pollutant Discharge Elimination System
PCC—Portland Cement Concrete
PROWAAC—Public Rights-of-Way Access Advisory Committee
PVC—Polyvinyl Chloride
R.O.W.—Right-of-Way
SUDAS--The Iowa Statewide Urban Design and Specifications
SWPPP—Stormwater Pollution Prevention Plan

ADA REQUIREMENTS: All requirements of the Americans with Disabilities Act shall be met. See www.ada.gov.

BEDDING & BACKFILL: Use manufactured sand (mansand) or Class I Granular Bedding (SUDAS Section 3010, 2.03) for all pipe envelopes on new construction. Use full-depth mansand or, if using acceptable existing material, reinforced concrete paving (#5 rebar on 12" centers) or sidewalks (#4 rebar on 12" centers) over the pipe trench. Mansand gradation shall be: 3/8" sieve—100% passing, # 4—90 to 100%, #8—50 to 65%, #16—20 to 40%, #30—10 to 20%, #50—5 to 15%, #100—0 to 10%, and #200—0 to 5%. Use of on-site backfill will be considered on a case-by-case basis. Where on-site backfill is allowed, mansand will still be required 1' above the pipe.

COMPACTION: A minimum compaction of 95% of standard Proctor density is required under paving and sidewalks; otherwise use 90% Proctor density.

CONCRETE: All PCC shall be a minimum of 4,000 psi compressive strength in 28 days (ASTM C-39). Fly ash mixes are encouraged if compressive strength is maintained. See the City Engineer for the maximum allowable fly ash content.

CONNECTION TO EXISTING INTAKES AND STORM MANHOLES: Only one sewer connection may be allowed for lots immediately adjacent to an existing intake or manhole. Parking lots not adjacent to structures shall be drained via driveways or piped into open waterways to avoid conflict with utilities. No drainage through the curb is allowed. Multiple storm lines leading from parking lots shall be combined at a separate structure prior to leaving private property. Pipe

placed within the R.O.W. shall be reinforced concrete or approved alternate. Connection to the existing structure shall be made with a concrete collar extending beyond the pipe wall on both sides. Openings in the structure shall be sawn.

CURB/CURB & GUTTER: Use 24" wide curb and gutter with standard 6" high curb (3" radii). See referenced SUDAS Figure 7010.7A—PCC Curb Details (www.iowasudas.org/specs/div7/documents/Fig7010.7A.pdf). Thickness of the gutter pan shall be at least 7" when used in conjunction with asphalt paving. Sloped curb is not allowed except where driveways are concentrated, such as in a cul-de-sac (check with the City Engineer).

CULVERTS: Roadway and driveway culverts shall, as a minimum, meet Section 4020 of the SUDAS specifications. Allowable materials are reinforced concrete pipe (Class I), zinc coated corrugated metal pipe (14 gage for 12" to 18" diameter), fiber-bonded bituminous coated corrugated metal pipe, and aluminized steel Type 2 pipe. Upon approval of the City Engineer or the Public Works Director, plastic pipe may be used in the R.O.W. where either the pipe or associated granular backfill will not be disturbed by utility excavations or borings or other construction in the area. Plastic pipe shall meet the requirements of Section 4146 of the Iowa DOT Standard Specifications for Highway and Bridge Construction and shall have no fillers.

DETENTION OR RETENTION PONDS: If a detention or retention pond(s) is proposed by a developer for runoff control, the developer's engineer shall provide pond volume and runoff computations showing existing and proposed runoff. Limit outlet pipe size to the peak 5 year-1 hour storm rate (using a rainfall amount of 1.95 inches). The overflow pipe or spillway should handle the peak 100 year-1 hour storm rate (using a rainfall amount of 3.50 inches). All detention or retention ponds shall have an outfall structure that is completely surrounded by water (the structure is to be separated from the berm). Liability insurance and maintenance and for the detention or retention pond and associated improvements shall be the responsibility of a neighborhood association to be established by the developer. See "RUNOFF RATES".

DRIVEWAYS: In the R.O.W., driveways shall have a minimum structural number (SN) of 3.0. This is equivalent to 6" of PCC or 7.5" of HMA. See the "Sidewalks" item. Obtain a driveway detail sheet from the City Engineer or the Planning, Zoning & Building Safety Department. The sidewalk portion of the driveway shall be minimum 6" PCC.

ENERGY DISSIPATION is required on all storm sewer outfalls with over 1% slope. Provide heftier designs as needed for steeper slopes. These may include custom-built flared end sections or riprap, mortared for high velocities.

EROSION CONTROL: Waterways over 2% slope are required to have permanent erosion control such as: mortared riprap, gabion mattresses, and/or erosion stone. Strips of erosion stone shall be continuous. Slopes shall have erosion control measures such as silt fencing, straw ditch checks, and temporary fencing. Provide an erosion control plan sheet. Mortared riprap shall consist of minimum 4-6" erosion stone set in a 4,000 psi concrete base that is 2-3" thick (pour concrete first). For construction sites larger than 1 acre, submit a Stormwater Pollution Prevention Plan (SWPPP) to IDNR, publish required notices, and do monitoring as re-

quired by the State permit. A copy of the SWPPP shall be submitted to the Plan Review Engineer. This item is required on private property to check compliance with the NPDES standards. Tables 2.2 and 2.3 of Chapter 2 of the Engineering Design Standards, City of Cedar Rapids, are approved by reference (www.cedar-rapids.org/engineering/documents/design_standards_ch2.pdf). These are permitted flow velocities for vegetated and unvegetated channels.

FLOW COMPUTATIONS: Subdivision design engineers shall provide stormwater and sanitary flow computations to the Plan Review Engineer for approval. Use the Rational Method (up to 20 acres) or the NRCS methods (TR-20 or TR-55)(20 acres and above) for stormwater flows. Use rainfall amounts from Bulletin 71, *Rainfall Frequency Atlas of the Midwest*, 1992 (also in the SUDAS Design Manual). Use a 1 hour storm peak for the Rational Method and a 24 hour storm peak for the NRCS methods.

For intakes and storm sewers that can overflow with no property damage (includes subdrain and footing drain flows)

- Rational Method: Use a 10 year-1 hour storm peak (2.09" rainfall).
- NRCS Methods: Use a 10 year-24 hour storm peak (4.44" rainfall).

For intakes, storm sewers, and waterways where overflow can cause property damage; as well as all detention basins--use SUDAS Design Manual, Section 2A-4C on "Design Frequencies For Conveyance Facilities" (www.iowasudas.org/documents/2A-4-06.pdf).

Determine pipe capacity, pipe entrance capacity, and intake capacity (excluding curb boxes) and use the smallest flow. For pipe entrance capacity, refer to the SUDAS Design Manual, Section 2N-2, Figure 5—inlet control nomograph for concrete pipe culverts (www.iowasudas.org/documents/2N-2-06.pdf). See the Neenah web site (www.nfco.com) for intake casting design charts. For curb intakes not in a sag, use the following rule of thumb:

Curb Intake Capacity = Clear Opening in linear feet x 0.5 cfs per foot / Percent S_L
(S_L=Longitudinal Slope. Use 1% minimum.)

FORESLOPES: Show cross-section foreslopes.

INSPECTION: Inspection services shall be provided by the engineering design firm and shall be paid for by the developer (see City Code Section 11-2-2, B.4). Brief inspection logs shall be submitted monthly on field inspection forms or in Microsoft Word format to the Plan Review Engineer via e-mail during construction activities. Inspection for the infrastructure shall be done at the following times:
Sewers—Full-time during pipe placement and backfilling. Manhole joint seals must be inspected and recorded by the project engineer prior to backfilling.
Paving—When checking and proof-rolling subgrade; after form setting or grade trimming; and full-time during paving.
The resident inspector shall make a final inspection and submit a punch list to the contractor. All items on the punch list shall be addressed before requesting acceptance of the infrastructure by the City.

INTAKES, CURB: Shape the gutter pan next to curb intakes identical to that shown for RA-40. Acceptable: Neenah R-3334 casting & RA-40 for low volumes and mild slopes; RA-43 (cast-in-place only) for high volumes or steep slopes.

INTAKES, COMBINATION: For general conditions and where curb intakes are inefficient, high-capacity combination grate/curb intakes shall be used. Acceptable castings for 6" curb: Neenah R-3295, R-3295-2, and R-3295-3. No plastic spacers are allowed.

INTAKES, GENERAL: Show box-out detail. Do not place intakes on inside of sharp curves on steep slopes since flow may bypass intake. Round intakes or manholes with grates shall not be used. Curb boxes or curb intake access lids shall be clearly marked with the words "NO DUMPING—DRAINS TO WATERWAY". Use either a plastic decal obtained from the Public Works Department or have the words imprinted in the casting. This labeling requirement does not apply to grate intakes.

INTAKES, GRATE: Generally not allowed without a curb box, but may allow Neenah R-3588-LL or R-3408 (L, AL, and BL) for special cases.

MANHOLES: Manholes shall be reinforced concrete. All manholes shall be 5' I.D. and shall have at least 4' of height below any flat-tops or cone sections. An interior coating may be required for sanitary manholes in a corrosive environment. Approved chimney seals, A-lok seals (or equal), and precast inverts are required on all sanitary manholes (transferred to inspection item). External manhole joint seals (wraps), that meet the approval of the Plan Review Engineer, are required on all sanitary manholes. Any grout added over precast manhole and intake bottoms (to connect pipe flowlines) shall be at least 2" thick. Grout voids near A-lok seals in the manhole base. Use eccentric (offset) manholes. Total height of adjusting rings shall not exceed 12". Drop sanitary manholes are required for an elevation drop of more than two feet. See Division 6, Section 6020 of the SUDAS specifications.

MANHOLE CASTINGS:

Manholes in unpaved areas, HMA pavement, and PCC slopes greater than or equal to 2%: Neenah R-1642 (24-1/8" I.D.)

Manholes in sags and on slopes less than 2% in PCC pavement: Neenah R-1955-1 (23" I.D.)(floating). Provide tied-in boxout.

Manholes subject to flooding, surcharging, or unsupervised children (bolt-down lid): Neenah R-1916-F (24" I.D.). Coat bolts with anti-seize lubricant—Permatex #80078 or equal.

Sanitary manholes shall have machined lids, concealed (non-open) pick holes, and the words "SANITARY SEWER" imprinted on them.

Storm manhole lids shall have the words "STORM SEWER" imprinted on them.

PAINT STRIPING: Show paint striping and turn arrows on plans, if applicable.

PAVEMENT: Use Iowa D.O.T. Standard Road Plans RH-45B, 50, 51, and 52 for PCC streets. Use approved pavement materials and a minimum 4" drainable base having a combined Structural Number of at least 4.00. See SUDAS Design Manual, Chapter 5 (under Pavement Thickness Design) for Structural Number layer coefficients (www.iowasudas.org/documents/5F-1-06.pdf). When driving concrete trucks on the drainable base, use a 8" base and regrade and compact. The HMA

mix design shall be approved by the City Engineer and shall be based on anticipated axle loadings.

RUNOFF RATES: It is the POLICY of the City of Muscatine, Iowa that all land developments/redevelopments subject to site plan review shall mitigate effects of storm water runoff by installation of necessary control structures so that post-development rates of runoff shall be less than pre-development rates of runoff for all storm events between two (2) year and one hundred (100) year, one-hour frequencies. Building Permits will not be issued for development/redeveloping until this POLICY is satisfactorily addressed in the City's Site Plan Review Process. Also see City Council Resolution No. 86860-0498 dated April 16, 1998.

SEWER EASEMENTS: Permanent maintenance easements are required for all sewers and culverts extending beyond the R.O.W. and shall be a minimum of 15' wide.

SEWERS, GENERAL: Provide a minimum of 42" of cover over sanitary sewers. No acute angle (reverse flow direction) intersecting pipes will be allowed. Intercept pipes at least 90 degrees. Go with the flow, not against.

SEWERS, SANITARY: Use truss pipe, vitrified clay, or ductile iron under 30' depth. Over 30' depth, ductile iron (push-joint) is required. Use A-loc seals (or equal) in manholes.

SEWERS, STORM: See ~~Chapter 2, Section 4.1 of~~ the SUDAS ~~Design Manual~~ Specifications. Patch any lift holes with concrete.

SEWER SERVICES, SANITARY (IN THE R.O.W.): Vitrified clay pipe, ductile iron pipe, or SDR 23.5 solid PVC pipe (minimum 4" I.D.) shall be used for serving individual lots with gravity sewers. Force mains shall be reviewed on a case-by-case basis. Sewers shall be connected to the new sewer main with a wye rather than to a manhole. Use Fernco couplers (or equal) for connections to dissimilar pipe.

SERVICES, GENERAL: The contractor shall mark the ends of water and sewer services with a 4"x4" wooden post. Wooden posts shall be painted blue for water services and green for sanitary sewer services. Depth in feet to top of service shall be carved or imprinted into the post.

SIDEWALKS: Show proposed sidewalk locations on subdivision plans even if not part of the initial installation. Show walks with the outside edge located 1' from the R.O.W. line, towards the street. Minimum width is 4'. Sidewalks should, generally, slope towards the street at the rate of 1/4" per foot (2%). Longitudinal grades shall not exceed 8.33% (12:1) slope or the grade of an existing street, whichever is greater. Sidewalks shall follow the layout shown on the approved Typical Cross Section in the subdivision plans. The concrete sidewalk portion of the driveway shall be installed prior to the rest of the driveway to establish the grades.

Within city limits, sidewalks shall be installed within the right-of-way on both sides of streets and cul-de-sacs. The subdivider shall install sidewalks according to the following specifications, or as may otherwise be required by the City.

Concrete Sidewalks; Specifications. An excavation shall be made a minimum of five (5) feet in width to a depth at least four inches (4") below the finished grade

of the walk; the subgrade shall be thoroughly compacted by mechanical means or hand tamping, and in such excavation shall be placed a concrete mix reaching four thousand (4,000) psi compressive strength in twenty-eight (28) days according to ASTM-39. In lieu of an excavation, the sidewalk may be placed on graded and compacted fill. When completed, the sidewalk shall be backfilled on both sides, filling the area between the sidewalk and the curb or street edge. Fill slopes shall not exceed 3:1. Concrete sidewalks shall be a minimum of four (4) inches thick, except as shown on the driveway/sidewalk detail sheet. Sidewalks shall meet the requirements of the current: (1) driveway/sidewalk detail sheet issued by the City Engineer, (2) Engineering Standards for the City of Muscatine, and (3) Iowa Statewide Urban Design and Specifications (SUDAS) for concrete sidewalks (in descending order of precedence).

Line and Grade. Sidewalk line (alignment) and grade (slope) shall be set by the City Engineer. The sidewalk grade will normally parallel the grade of the street.

STANDARD DESIGN MANUAL AND SPECIFICATIONS: The Iowa Statewide Urban Design and Specifications (SUDAS) are the City of Muscatine's standard design manual and specifications. Use the most current standard if there are any conflicts between the design manual and the specifications. Iowa DOT Standard Specifications for Highway and Bridge Construction and Iowa DOT Standard Road Plans may also be used, if not in conflict with the SUDAS standards and specifications and if allowed by the Plan Review Engineer. These City of Muscatine Engineering Guidelines take precedence over any standard specifications. The SUDAS documents may be accessed on the Internet at www.iowasudas.org.

STEPS IN STRUCTURES: For intakes and manholes over 4'deep to the bottom or protruding pipe, provide plastic-coated steel steps on 16" centers.

STREET WIDTH: See City Code Section 11-2-2(B-3) and 12-2-3(B).

SUBDRAINS are, generally, required per Iowa DOT Standard Road Plans RF-19C and RF-19E or RF-22. However, the subdrain requirement may be waived for roads with ditches where rural street standards are allowed.

TESTING: Televise and furnish a compatible video for all storm and sanitary sewers. Pressure test gravity sanitary sewers at 5 psi for 1 hour. Pressure test sanitary force mains at 50 psi for 1 hour. A 1% pressure drop is allowed in either case. Perform an exfiltration test on sanitary manholes according to SUDAS specifications Section 4040. A mandrel test is required by the Iowa DNR for flexible sewer pipe materials. Test concrete and soil compaction. Submit all results prior to acceptance.

TRACER WIRES: Install a tracer wire on all new or replacement sewer force mains and sanitary sewer service laterals. Follow detailed drawings that are available from the Collection and Drainage Supervisor or the City Engineer. For force mains, install wire access ports at least every 500'.

UTILITIES: Show all proposed utility locations on a typical R.O.W. cross-section so there is not a lack of space planning. The Project Engineer shall call a joint utilities meeting during the preliminary design to discuss utility layouts. Above-

ground wired/fiber utilities on a single pole line are preferred. Use the utility lay-out figures shown in the SUDAS Design Manual (Chapter 9). Utility trenches underneath pavement or sidewalks shall be backfilled with compacted mansand or shall be spanned with reinforced concrete.

WHEELCHAIR RAMPS (DETECTABLE WARNING PANELS): See the SUDAS specifications for detailed drawings. Stamped concrete is not allowed for truncated domes in the Right-of-Way. Use pre-cast truncated dome panels (see the Street Maintenance Supervisor or the City Engineer for currently approved manufacturers). The color shall be red or as specified by the Public Works Director. Dome spacing must meet SUDAS requirements. Detectable warning panels are not required for unsignalized driveways with curbs, but wheelchair ramps are still required in accordance with PROWAAC recommendations.